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" Scire est nescire, nisi id me
Scire alius sciret.

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MEDICINE AND PSYCHOLOGY.[1]

BY

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" Psychologus nemo nisi physiologus."—JOHANNES MÜLLER.

THE scientific study of the behaviour of human beings has been neglected by the medical profession. Behaviour is the end result and outward manifestation of complex mental processes. Only a small proportion of medical men have paid much attention to the laws which govern mental processes, and these few have been principally alienists, devoted to the study of grossly pathological mental states. Medical students are compelled to spend years in acquiring a knowledge of the structure and functions of the human body, but are left with little or no instruction in the activities of the mind

[1] Address delivered at a meeting of the Bristol Medico-Chirurgical Society, January 11th, 1922.

which the body subserves. No one would dream of teaching pathology without a preliminary course of physiology, yet every doctor is daily called upon to treat neuroses and psychoses with quite inadequate training. The stress of modern life, culminating in the War, has greatly increased the amount of mental instability, more particularly in those less severe forms which come under the observation of general practitioners and others who are least well equipped to deal with them.

There has thus been created an imperative demand for instruction in psycho-pathology. The demand has coincided with the astonishing development of a new school of psychology, founded by Professor Freud, of Vienna. The attractiveness for various reasons of Freud's theories and speculations has led to a flood of literature on the subject, much of it written by facile authors ignorant of the well-established principles of the older psychology. Freudism has been elevated into a cult, its truths have been overlaid with speculations, and the unconscious has usurped an autonomy which it is scarcely likely to maintain.

If the "new psychology" provides an incomplete and unsatisfactory basis for the psychological training of the medical man it becomes necessary to define the psychology which fills the rôle adequately. In order to do so it will be necessary, in as few words as possible, to explain what I regard as the scope of psychology *as a science*, for the term is used in such a haphazard manner that much confusion results.

The Scope of Psychology.—Psychology is the offspring of philosophy, and it is by almost imperceptible stages that it has germinated and finally attained an independent existence. Philosophy is the manifestation of the irresistible impulse of human beings to account for themselves, the universe and their placé in it. The evolution of free ideas and conceptual

thought has endowed humanity with imagination and an immense capacity for devising speculations.

The gradual emergence of science from philosophy is the greatest achievement of human thought. It has resulted from a gradually increasing control of the flights of speculative imagination. Only in this respect do the fundamental principles of science differ from those of philosophy. For science, like philosophy, is built upon a foundation of speculation, and the all-important question is, What is the difference between philosophical and scientific speculation? It is convenient to distinguish between them verbally, and I propose to call the former speculation and the latter hypothesis. I think that the essential difference between speculation and hypothesis is utility. Utility is, and always has been, the prime motive force of living organisms and the predominant condition of evolution and progress. There is good biological evidence to support this view, for from the amœba upwards success in action is attained through the principle of " trial and error." Now, scientific hypothesis is the application on the highest plane of the principle of " trial and error," and an hypothesis is of no scientific value—and, therefore, is not an hypothesis in my restricted use of the word—unless it leads to success, *i.e.*, verifies established relations (" facts ") and can be projected into the establishment of hitherto undiscovered relations.

Increased precision of thought, brought about chiefly by advance in knowledge of astronomy, mathematics and physics, together with the more slowly advancing knowledge of biology and physiology, due chiefly to physicians, led to the replacement in the domain of science of vague and varied speculations about the soul by the concept of the mind. Mind has had almost as varied connotations as soul, but in the past it has generally been regarded as equivalent to consciousness, so that psychology has been defined as the

science of the mind or the science of conscious processes. Galen first showed that the brain was intimately concerned with conscious processes, and indeed taught that it is the seat of the " soul " and the medium through which sensations are produced. This was a great step in advance. It established a scientific relationship between the body and conscious processes, and so initiated a scientific psychology founded upon physiology.

Mind, however, is too general a term to apply as a satisfactory criterion of the meaning of psychology. Mind includes all conscious processes, and without further limitation would embrace all knowledge and all the sciences, for none is possible without the activity of the mind.

Consciousness, on the other hand, is too narrow, for psychology deals with the whole mental history of the individual, and consciousness includes only such mental processes as rise above the threshold, the waves on the surface of the stream. At a time when the Unconscious plays so large a part in modern psychology to labour this point it is scarcely necessary. I need only remind you that subliminal mental processes occur temporally in sleep, in inattention, in oblivescence, and spatially in the fringe of the field of consciousness ; that the unconscious includes what James Ward has called sub-presentations ; that it is the seat of inherited instincts and acquired habits ; and that it is a reservoir of suppressed ideas in the form of memory images, ideas which are inhibited in the interests of the integration of thought, just as Sherrington has taught us that reflexes are integrated by inhibitory processes, and the great mass of repressed complexes upon which Freud and his followers lay so much stress. We have learnt to recognise that the stream of mental processes is continuous, rising rhythmically or at intervals above the threshold of consciousness. Mind is subjectively continuous ; only as

the stimuli of interest, meaning, or suggestion succeed in forcing presentational, conative or ideational objects into the focus of attention do mental processes appear to be objectively discontinuous. [1]

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The objections to the term "behaviour" as a criterion of psychology, apart from the unimportant fact that the term is commonly applied to non-living as well as to living things, has the great disadvantage that it lays stress upon the objective aspect of mental processes. Behaviour has hitherto always implied the behaviour of other animals or other people, and one's own behaviour implicitly indicates our activities as they appear to other people; and although it is not only legitimate, but very desirable, to define accurately the scientific connotation of words adopted from common parlance, as McDougall has well insisted, yet too great a dislocation of the generally accepted significance is undesirable, especially in a fundamental definition.

Nearly all psychologists agree that pure psychology is fundamentally concerned with the subjective aspect of mental processes. And it can scarcely be otherwise; for it is impossible to include the objective aspects as an integral part of the science without invading domains best left under the jurisdiction of other sciences, *e.g.* natural history, biology, etc. At first sight this appears to limit psychology to the old introspective psychology, for all will admit that the individual is conscious only of his own consciousness. And since the most perfect knowledge of a single individual's mental processes does not constitute a science, it would appear that a science of psychology is impossible. But while the objective aspects of mental processes in others should not constitute an integral part of pure

[1] We regret that we are obliged to omit the critical review of definitions of psychology by F. Ward, G. F. Stout and others.

psychology, it must be admitted—at worst as a mere hypothesis, if need be—that these objective processes are legitimate data for the elaboration of the science. This too can be hardly otherwise ; for it is clear that even in introspection the mental processes analysed *ipso facto* become objects. It is unavoidable that they thereby become changed in character, and it may well be doubted whether the data which, thus changed, they afford are more reliable than the data derived by judicious inference from the " behaviour " of other individuals.

It suffices for practical purposes if definition indicates the general scope of the science and its limitations in such simple phraseology as to be readily understood and as free as possible from ambiguity. For here again utility is the criterion, and definitions are for the uninitiated.

It seems to me that, provisionally, most of the objections urged against previous definitions would be avoided by the following : *Psychology is the science which treats of the laws of the evolution, organization, and manifestations of the mental processes occurring in living organisms in their relation to the organisms in which they occur.*

The Data of Psychology.—In defining psychology great stress has been laid upon the necessity for limiting its scope to the *subjective* aspects of mental processes. In dealing with the data of psychology it is important to realize that *all* the data are psychologically *objective*, and that the laws of psychology are merely inferences from observed relations (" facts ").

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In no science is it more important than in psychology rests should conform to the best authenticated principles of those other sciences which are less open to criticism. Like other sciences it must proceed from the known to the unknown.

Now, the fundamental known fact for psychology as a science is that the only immediate knowledge of mental processes which I as an individual possess is that they are inherent in me *as a living organism.*

The study of the physiology of the central nervous system and organs of special sense has produced a vast volume of evidence as to the origin of sensations and the functions of the various parts of the nervous system in their co-ordination and integration. Research has elucidated many of the chief functions of the spinal cord, the basal ganglia, and the cortex cerebri, and though our knowledge is still very imperfect, all neurologists agree on certain fundamental points. Among these is the deduction that in man the cortex cerebri is the chief seat of those nervous processes which, in some manner as yet unknown, give rise to conscious mental processes. It is further agreed that motor activities are the responses of the central nervous system to the sensory impulses which impinge upon it : that both sensory impulses and motor responses are co-ordinated and integrated in highly complex ways, resulting in synergic activities of the organism which form at any rate a very large part of what is called its behaviour. Further, it is known that these activities of the nervous system are profoundly modified and influenced by the action of glandular secretions. It is a legitimate scientific hypothesis, founded upon these facts, that both conscious processes and behaviour are contingent upon nervous processes. Biologists and physiologists indeed accept this as their working hypothesis. It is only when the higher mental processes—ideation, conceptual thought, imagination, and so on—are the subject of inquiry that this hypothesis is tacitly ignored or denied and the philosopher steps in with his esoteric speculations. It seems easy to admit that sensations give rise to perceptions, though the physiologist shirks the psychological element of *meaning*

involved in the latter, but it is difficult to conceive of the neurological basis of a flight of imagination. Yet if psychology is a science it must proceed from the known to the unknown, and until knowledge has advanced to that stage at which the unknown becomes amenable to the resources of scientific investigation it is not a fit subject for scientific treatment.

If then we accept as a fundamental hypothesis that mental processes are correlated with nervous processes the biological evolution of the nervous system in various species becomes important to psychology; and further, if nervous processes and the mental processes to which they give rise lead to characteristic motor activities and behaviour, these become available as evidence of the mental processes of other individuals and of animals. The field of psychological investigation is thus widely extended, embracing (1) animals (*comparative psychology*), especially from the evolutionary point of view (*phylogenetic psychology*); (2) human individuals, in the objective sense of *other* individuals, including the development of human minds (*ontogenetic psychology*); (3) groups of individuals—for the behaviour of individuals acting together in groups shows specific peculiarities (*collective psychology*); (4) human races, primitive and advanced, including their cultural development (*anthropological psychology*); (5) the effects of disease upon mental processes, including neuroses, psychoses, criminology, etc. (*psycho-pathology*).

Finally, we arrive at what was historically primary, though it more or less unconsciously utilized much of the evidence derived from the sources mentioned, viz. *introspective psychology*, which must necessarily be the final court of appeal: (1) because it is the unique source of our knowledge of what consciousness is; (2) because through it alone can we directly investigate and analyse conscious processes

and our own activities and behaviour as the manifestations of our own mental processes, thus obtaining a criterion in the behaviour of others for their mental processes. As Stout says of the validity of this criterion : " All depends on accurate resolution of his own complex consciousness into its constituents, and on re-compounding these in such a way and in such proportions as to explain the nature and order of the signs which indicate to him the mental processes of others." [1]

The mental processes in various individuals vary owing to acquired characteristics derived from tradition, social environment, and individual life-history, *i.e.* the previous experience of the individual.

The study of comparative psychology, collective psychology, anthropological psychology, and psychopathology has led of recent years to an appreciation of the predominant importance of the instincts as the prime motive forces of human as well as of animal behaviour. The application of the theory of evolution to the mind, begun by Darwin himself, is chiefly responsible for this great advance. Only by the study of behaviour in animals, savages, groups of men and women, and the subjects of neuroses and psychoses, was it possible to attain any sure knowledge of the instincts and their potency : for these are least of all submissible to the method of introspective analysis. Phylogenetically primitive mental states, such as the instincts, tend to be suppressed from consciousness and relegated to the unconscious. Only when they are excited by appropriate perceptive stimuli do they issue in impulsive conative acts, accompanied by conscious affective tone. The primitive emotions which colour instinctive reactions are inchoate and defy precise analysis by introspection. Nevertheless, introspection is the final and crucial

[1] *Analytic Psychology*, vol. i., p. 15.

test of the psychological significance of mental states from the subjective point of view. Guided by the indications derived from behaviour in animals, and so on, it conclusively supports the view of the predominant importance of the instincts as springs of conduct in men.

Psycho-pathology has carried the advance still further forwards. It has shown that the commonest forms of mental disorder—hysteria, neuroses, etc.—are due to conflicts in which the instincts war one with the other or with the canons of conventional behaviour. Owing to the painful nature of the conflict it is suppressed from consciousness and lies hidden in the unconscious. It is none the less potent in influencing behaviour, which thus becomes disordered. It cannot be denied that psychology owes an immense debt to Freud for the fundamental principles of his theory. Few will deny the general truth of his views on the suppression of conflicts, on sublimation, etc., and on the principle which lies at the root of psycho-analysis. They are founded on a secure scientific basis. It is in their elaboration that he and his followers quit science and launch out into speculation of more than doubtful validity.

Freud's theory is an example of the method of explaining the infinite intricacies of human behaviour by an appeal to a single principle. Hobbes found the key to the riddle of human nature in fear ; Bentham, the Mills, and the other Utilitarians in the pursuit of happiness ; Comte and the Positivists in altruism. Others have found the all-embracing principle in some special characteristic of the herd instinct, stress being variously laid upon imitation (Bagehot, Tarde, le Bon, E. A. Ross, and others), sympathy or suggestion, the last mentioned being specially applied to psycho-pathology by the old and new Nancy schools. There can be no doubt that this artificial simplification of the highly complex problem has been useful in stimulating

thought and investigation and in eliciting valuable results. There can be equally no doubt that it leads to paradoxes which prove the fundamental unreliability of the method. Freud's "sexual" man will prove in the long run to be as impotent as those other theoretical monstrosities, the "economic" and the "ethical" man.

If this sketch of the scope and data of psychology is correct, it is clear that the science of psychology must be founded upon biology and physiology, and the teachers of psychology should be selected from men who have had a thorough training in these subjects. Yet when we consider the teachers of psychology in our Universities to-day we find that this is the exception rather than the rule. Most of them are the products of a mediæval classical education, and have devoted their lives to the study of philosophy rather than science. Further, just as general pathology is one of the main sources of knowledge of general physiology, so psycho-pathology is one of the main sources of our knowledge of psychology. Hence it is eminently desirable that teachers of psychology should also be fully qualified medical men. Indeed, there is no other class of men so well equipped by training from which to select specialists in psychology. Some of our Universities are at last recognising this fact. On the other hand, it is undesirable that psycho-pathologists who have not devoted exhaustive attention to general psychology should be regarded as the authoritative exponents of the science. Their purview is too narrow and their perspective is warped.

For my own part I should like to see psychology ruthlessly divorced from metaphysics and philosophy, and given a status of its own in the Faculty of Science. The curriculum in psychology, in addition to a preliminary grounding in general science, should contain exhaustive courses of biology and physiology, and only those who have passed an

intermediate examination in these subjects should be allowed to present themselves for examination in psychology. The University of Bristol is pre-eminently fitted to establish such a reform, for its late Professor of Psychology, Professor C. Lloyd Morgan, is, without exception, the greatest living biological psychologist. Such an example would make it impossible for psychology to be taught in any British University by those who have not had an efficient training in biology and physiology.

Further, I am strongly of opinion that every medical student should be instructed in the rudiments of psychology, not only because he will find it useful in his professional career, but also because the scientific principles of psychology which he will thus acquire will increase his interest in the behaviour of his fellow-creatures and enable him to propagate the gospel to those among whom he lives. He will cease to be gulled by the false so-called psychology which is rampant, and will exercise a steadying influence upon the minds of those with whom he comes in contact. I think that this elementary course of psychology should follow upon his physiology course. Towards the end of the curriculum he should have a course of instruction in psycho-pathology.

It will doubtless be objected that the medical student's curriculum is already overcrowded. It is impossible to discuss this thorny question now. I will merely state that in my opinion a thorough revision of the whole medical curriculum is inevitable in the not distant future. Such a revision will prune the qualifying curriculum and examinations of many useless smatterings of knowledge, leaving time for subjects of greater practical importance. It is no longer possible satisfactorily to produce efficient general practitioners and hospital physicians and surgeons from the same mill. The qualifying curriculum and examinations, which all must pass, should be directed primarily to the production of

efficient general practitioners, and much that is now crammed into the curriculum and scampered through should be relegated to postgraduate courses and examinations for higher or special diplomas.

RENAL EFFICIENCY.

A Discussion held at a meeting of the Bristol Medico-Chirurgical Society on November 9th, 1921.

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The modern methods employed in the investigation of the renal efficiency are directed towards an estimation of those substances which, if the blood plasma is to remain of constant chemical composition, must be excreted. In actual practice this means the non-protein nitrogenous substances (chiefly urea) the chlorides and water.

Two other functions of the kidney, the maintenance of the normal osmotic pressure of the blood and of the normal reaction of the blood, still remain as regard their application to clinical medicine largely in the province of the experimental physiologist.

No single test can do more than give an indication of the depressed function of the kidney at the time the test is performed, nor can it indicate the possibility of functional repair; and, further, it cannot be emphasised too strongly that the interpretation of any tests is impossible apart from a consideration of the clinical state, more especially of the cardio-vascular system.

It may be well to recall some of the accepted facts of the

normal physiology of the kidney. In health the kidneys are only partially active. It has been estimated that one-fourth to one-sixth of the total kidney substance is sufficient for the average daily requirements. This very considerable reserve of potential activity in the normal meets all demands. On the experimental side Rose Bradford showed that large amounts of renal tissue, up to two-thirds of the total amount, could be removed and the animal kept in health.

The diseased kidney, on the other hand, works at a maximum, and thereby may maintain tolerable health for an indefinite period. By the time we obtain, in cases of chronic interstitial nephritis, a result suggesting exhaustion of this reserve a very considerable fraction of kidney substance, about three-quarters, has been destroyed.

From this time urea and other nitrogenous substances, such as uric acid, creatinin, amino-acids, and ammonia, tend to accumulate in the blood. Temporary circulatory changes in the kidney, *e.g.* passive congestion, inflammatory œdema, back pressure from mechanical obstruction to the outflow of urine, may produce a similar result indicative of partial or complete renal inefficiency.

Taken in conjunction with the clinical examination, the tests afford data for prognosis and treatment.

Dr. Symes and I have carried out a variety of renal efficiency tests in 50 cases of kidney disease, and have learned to place the greatest reliance on those concerned with the capacity of the kidney to excrete urea, namely the two-hour specific gravity test of Mosenthal, the urea concentration test, and the estimation of the blood urea.

Two-Hour Test.

There are certain details which require emphasis. The amount of fluid given should be known and should be at least 2,000 c.c., the diet should contain a moderately high

amount of protein, the midday meal in particular should include about 5–10 grams of salt. Nothing is to be taken between meals, and the last day collection should be 2½ hours after supper. The normal response shows a specific gravity varying more than eight or nine points, fluid taken at meals is quickly excreted, the day amount greater than the night, the latter not over 400 to 500 c.c. of a specific gravity of 1,018 or more. The day and night ratio is in health about 4 : 1 ; in nephritis it may alter to ratio 1½ : 1 or 1 : 1. The total urine excreted should not be less than 75 per cent. of the fluid intake. The concentration of salt in the specimens varies considerably ; it is eliminated quickly, nitrogen more slowly.

Lichtwitz [1] carries out this procedure in much greater detail. First the normal day, then on following days three-quarters of 1 litre of water, 10 grams of sodium chloride, 20 grams of urea are added to his standard diet.

The important point for consideration is the fixation of the specific gravity : the level at which it is fixed depends on many factors.

Fixation at a low level is the usual finding in chronic interstitial nephritis, with an increase in the fluid output and nycturia (10 cases) ; fixation at a higher level in acute and subacute nephritis, most cases of parenchymatous nephritis, in the passive congestion of myocardial inefficiency. In one such case examined seven successive specimens were of specific gravity 1,016. In the arterio-sclerotic kidney the specific gravity is often fixed at a high level, but the results are variable, depending mainly on the circulatory efficiency.

A study of the normal response seems to show that the point on which stress is laid, namely a variation of more than eight points, depends chiefly on the excretion of urea and water primarily, chlorides to a less extent. The

percentage of urea in the charts follows the specific gravity very closely.*

It is of interest to note that even in cases of diabetes mellitus undergoing the preliminary alimentary rest of modern methods of treatment one specimen yields a specific gravity of 1,020 (in the absence of dextrose). This is stated to occur in professional starvation.

Mosenthal's [2] observations on two points in treatment may be mentioned here. In the absence of disease a high fixed specific gravity is suggestive of too little intake of fluid; the resulting constipation and burning micturition require an increased intake of fluid by way of treatment.

In 6 cases of slight renal deficiency he found that a high protein intake was followed by a doubling of the night output.

Newburgh [3] noted that forced meat feeding in normal men caused the appearance of red blood cells in the urine. In 4 cases of high blood pressure such high protein diet was followed by a microscopic hæmaturia and the appearance or increase of albumin in the urine.

A disturbance in the fluid output is an early sign of damaged kidney. This is better ascertained from observing the relations between the day and night output than by the water excretion test; the latter test has given us very variable results.

Urea Concentration Test.

This test is easily carried out, and is perhaps the most widely accepted of all the renal tests. Its principle depends

* NOTE.—A 1% solution of Urea has a specific gravity of 1002·8.
2% " " " " 1005·6.
1% " NaCl " " 1007·2.
A mixture of 2% Urea and 1% NaCl has a specific gravity of 1013.
Up to 7 parts per 1,000 albumen has very little influence on the specific gravity. The correction factor is 0·26 per 1%.
Specific gravity is taken with a *pyknometer*; urine at room temperature.

on the power of the kidney to concentrate urea; if the percentage of urea in the blood be taken as 0·02 per cent. and the urine contains 2 per cent., then the urea has been concentrated 100 times.

We have used the dose recommended by H. MacLean, namely 15 grams. McJunkin gives 30 grams, Lichtwitz 20 grams. An excretion of 2 per cent. or more means an efficient kidney. A low percentage, 1·4 per cent. or 1·5 per cent., suggests moderately severe renal inefficiency (MacLean). By the time we get a low result in chronic interstitial nephritis we can assume that a considerable fraction of the kidney substance has disappeared and that a terminal stage is approaching. In our 12 cases of chronic interstitial nephritis the low reading was associated with a rise in the blood urea figure in 9 out of 10 cases so examined.

MacLean,[4] summarising his experience of this test in 10,000 cases, points out one advantage, in that it indicates lesions of a much slighter degree than are detected by blood urea examinations. In cases of acute nephritis (MacLean) the urea test showed a defect long after the blood urea had gone back to normal. But we still require a test in clinical medicine which will indicate that a destruction of glomeruli is proceeding even when the kidney can furnish a specimen of urine containing 2 per cent. or more of urea. The only abnormal finding in a case of high blood pressure (Chart 4) was fixation of the specific gravity at a high level and nycturia.

At present this test is very widely used, and based on its results, the Ministry of Pensions have worked out a mathematical scale of awards, the pension awarded being inversely proportional to the amount of urea excreted. One caution is necessary—the urea occasionally causes a marked diuresis in those who have been imbibing large quantities of fluid prior to the dose. This diuresis may be sufficient

to give a lower reading than normal. The normal response at the end of the second hour is from 80 to 150 c.c. of urine.

In 5 cases of chronic parenchymatous nephritis percentages of 2 or more were found. This remarkable result is difficult of explanation, but the gross albuminuria, the œdema and diminished chloride content of the urine, etc., are sufficient in themselves to indicate the severity of the renal condition.

Blood Urea.

The normal limits given by various writers vary from 10 to 25 milligrams per 100 c.c. of blood. There is general agreement that a figure above 40 mg. per 100 c.c. indicates a retention of urea in the blood.

The total non-protein nitrogenous substances and other extractives rise *pari passu* with urea nitrogen, and practically it is sufficient, and certainly easier, to determine the urea figure. Myers and Killian consider that the blood creatinin figure gives a more reliable figure for prognosis (normal 0·1 to 0·8 mg. per 100 c.c. ; in renal disease from 2 to 42 mg.).

In acute nephritis the blood urea figure is of value, and although raised, it does not reach such high grades as in renal cirrhosis. In 6 of our cases of acute and subacute nephritis values of forty to sixty coincided with low values for urea excretion and with a severe clinical condition of nephritis. Lower values were associated with a steadily improving general condition. In chronic nephritis as above stated much higher values are found, 90 to 120 or more. Such figures indicate a definite gravity of prognosis. A rising quantity is undoubtedly of grave import. In one case the figure rose from 60 to 112 in an interval of six months. The inefficiency associated with myocardial failure may give also readings up to 180.

All cases of interstitial nephritis do not of necessity show an increase in the blood urea nitrogen. Up to a certain

stage the excretion of urea may be the same as that of a healthy man. The lack of power of concentration of urea is met by an increased excretion of fluid, the damaged kidneys working at their utmost capacity, producing a constant output with a low urea value—a compensatory phenomenon.

Blood urea estimations have proved of value in cases of prostatic enlargement. A recent paper by Dobson [5] endorses this examination as the most valuable pre-operative prognostic test. The renal inefficiency consequent on back pressure effects is associated with a rise in the blood urea, a decided fall occurring after preliminary cystotomy in cases likely to do well. MacAdam [6] finds in such cases (number unspecified) a rise in the blood urea to 80–200 mg. per 100 c.c. After supra-pubic drainage for 7–14 days the figure fell to 20–30 mg. per 100 c.c. He considered that the mechanical back pressure produced its effect by interference with the normal filtration through the glomeruli, with the resultant nitrogen retention. Over 30 mg. per 100 c.c. was considered as a figure indicative of the necessity of preliminary treatment.

The blood count in 3 cases so examined of chronic interstitial nephritis with nitrogen retention showed a secondary anæmia :—

F., æt. 43, 105 mg. urea. Total reds, 3,075,000 per cm. Hb. 50 per cent.

M., æt. 48, 121 mg. urea. Total reds 3,500,000 per cm. Hb. 41 per cent.

F., æt. 56, 95 mg. urea. Total reds, 4,000,000 per cm. Hb. 55 per cent.

Essential Hypertension (arterio-sclerotic kidney).

The efficiency tests in 6 cases not associated with obvious myocardial failure gave fairly constant results. The blood urea was not raised, and at the most the two-hour test

showed nycturia, fixation at a high level, or some slight loss of power to concentrate urine. The urea concentration test gave percentages of 2 or more.

Chlorides.

The food is the main source of chlorides; the normal individual varies very much in the amount of chloride excreted in a given time, and it is for this reason that a chloride concentration test is not in common use. The normal figures given vary from 5 to 25 McCracken; Mosenthal, 5 grams; Rose Bradford, 10 to 15 grams. The majority of our cases on hospital diet showed an excretion of 4–8 grams.

Retention of chlorides occurs in chronic parenchymatous nephritis, but one can assume in the absence of œdema that salt is not retained to any appreciable extent. (0·6 per cent. NaCl retained in the tissues requires 100 c.cm. of water.) The primary difficulty may be inability to excrete water and consequently retention of chloride.

A strict " chloride free diet " introduces about 1·5 grams daily, an amount within the capacity of the badly-damaged kidney to excrete. Three pints of milk means from 4 to 6 grams of salt.

Unless repeated examinations are made in nephritis the estimation is not of great practical value. Without going into the difficult question of the causation of general œdema in chronic parenchymatous nephritis, one cannot assume that deficiency in chloride or water excretion is the whole explanation.

It may be of interest to note here that excessive ingestion of salt has caused œdema. J. H. Bryant [7] reported a case of œdema of feet and legs in a man of 40 years taking 40 grams daily. The urine contained 1·86 per cent. chlorides (about three times the normal figure), and with restriction of intake

the percentage fell to 0·98 per cent., with disappearance of the dropsy.

Phenolsulphonephthalein Test.

It is claimed for this test that it is superior to the other dyes hitherto in use in that an exact mathematical figure is obtained by the colorimetric method, further that the curve of excretion is, unlike that of methylene blue, monocyclic. The colour produced by the interaction of dye and urinary pigments is difficult to compare with the standard. Moreover, observers differ in their appreciation of intensity of colour.

We have found, as others have determined, that in a general sense it affords evidence of renal deficiency ; greatly diminished values in interstitial nephritis, high values in arterio-sclerotic kidney, low values in acute and chronic parenchymatous nephritis. The results do not run parallel with the urea concentration test. Weiss considers that when it is sufficiently abnormal to be positive it is by then associated with fairly definite physical signs. Leathes says, "Abel's test appears to perform more than it could possibly promise, and is capable of no interpretation." It certainly cannot be measured with such accuracy as to allow of an increase of diet in the event of a 5 per cent. or 10 per cent. rise in excretion.

Geraghty [8] reports on the results obtained with the test in 60 cases of urinary obstruction. As a rule the test demonstrated the greatest impairment of function in cases which had a large residual urine and had not been leading a catheter life. If the excretion was below 20 per cent., and the time of the first appearance of the dye beyond 25 minutes, the operation should be postponed without regard to the clinical condition. If with treatment the output remained low but constant, the suggestion is that the kidney has undergone chronic interstitial changes.

In 40 cases of renal infection, whether uni- or bilateral, the diseased organ was correctly indicated; in all cases of tuberculous kidney the excretion of the drug gave a correct index of the renal function.

Albuminuria.

The degree of albuminuria is a useful indication of the type of kidney, the largest amounts being found in parenchymatous nephritis, variable amounts in acute and subacute nephritis, and in passive congestion down to the classical trace in renal cirrhosis.

MacLean [9] considers that neither albuminuria nor casts are of much value in estimating renal efficiency. This opinion is based on an examination of 50,000 cases. He found albuminuria in 5·62 per cent., gross in 2·55 per cent.; albumen with casts in 1·88 per cent. (936 cases), in moderate numbers 1·1 per cent. (550 cases). He concluded that at least 550 (1·1 per cent.) of the Active Service portion of the Army consisted of men whose kidneys are inefficient. However, the finding of albuminuria will always mean a detailed clinical examination supplemented by other tests, whatever may be the percentage of apparently fit men who have albuminuria. The effect of exercise in increasing the number of cases with albuminuria was noted in the above investigation, but clinical experience does not yet permit us to say, for example, how long a case of parenchymatous nephritis has had albuminuria before seeking medical aid. It is not unusual for the supervention of œdema to call the patient's attention to his condition.

In conclusion, the problem is not that there are insufficient tests; there are too many, several not worth employing. As a routine procedure we would lay the greatest stress on (1) clinical examination, (2) the two-hour test to estimate the quantity, day and night ratio, (3) the

urea concentration, (4) blood urea examinations in acute cases and in interstitial nephritis.

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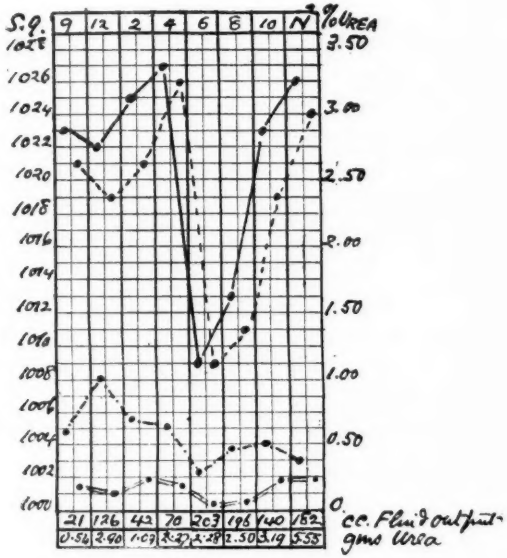
Normal.



$$\frac{D}{N} = \frac{798 \text{ c.c.}}{182 \text{ c.c.}}$$

Total urea = 21 gms.
Total chlorides = 5·04 gms.
Total phosphates = 1·5 gms. (approx.).

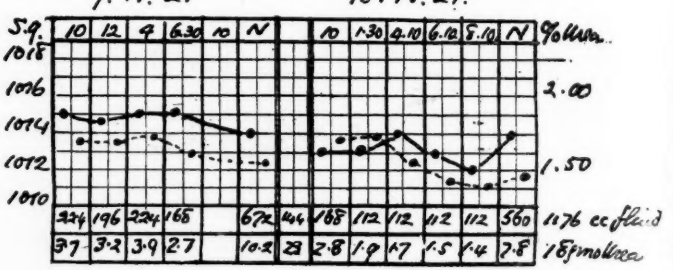
Specific gravity
Urea per cent.
Chlorides
Phosphates

Normal.

D 1357 c.c. / N 330 c.c. — Urea, 25·5 gms.

D 938 c.c. / N 270 c.c. — Urea, 25·5 gms.

Chronic Interstitial Nephritis. Age 48.

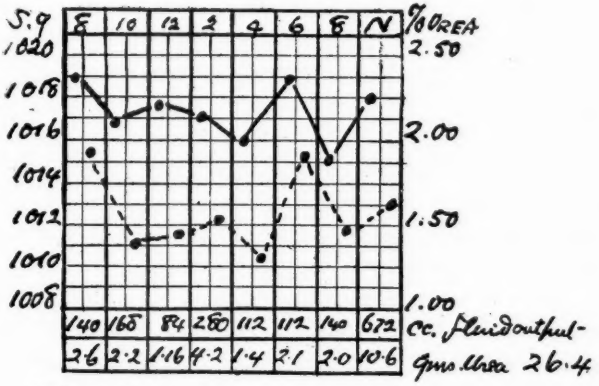


D 812 c.c. / N 672 c.c.

D 616 c.c. / N 560 c.c.

B.P. 210–130. Urine, F. and albumen, granular cast.
Blood urea, 121 mg. per 100 c.c.
Urea Concn. test, 1·36 per cent. and 1·41 per cent.
P.S.P. test < 20 per cent.
Total chlorides, 4·6 gms., 7. N. 21.

Arterio-Sclerotic Kidney.
(Essential hypertension.) Age 38.



Male. B.P. 230–140.
Cardiac hypertrophy.
Urine : No albumen, no casts.
$\frac{D}{N} = \frac{1036}{672}$. Blood urea, 20 mg. per 100 c.c.
Urea Concn. test, 2·53 per cent. and 2·75 per cent.
P.S.P. test, 68 per cent.
Chlorides. Totals for 3 successive days :—
Urine, 1,330 c.c., s.g. 1,018, 8.7 gms.
1,300 c.c., s.g. 1,015, 8·4 gms.
1,225 c.c., s.g. 1,014, 8·1 gms.

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HAVING used the tests of renal efficiency in both hospital and private practice for a period of four years, I propose discussing their value from a purely clinical standpoint in diagnosis, prognosis, and treatment.

Of all the tests I regard the two-hourly specific gravity test as the most useful, for not only do we ascertain whether there be a fixed high or low curve, which is of course

unfavourable, but at the same time we get a rough idea of the urea elimination, the curve of which closely corresponds with that of the specific gravity. Incidentally, too, we measure the daily quantity of urine passed, and can compare this with the intake of fluid, and can compare the quantity of day and night urines.

The blood urea test is of great value in diagnosis, prognosis and treatment. The blood (5 c.c.) is withdrawn from a vein by means of an ordinary serum syringe, and when shaken up with a few crystals of potassium oxalate is ready for transmission to the laboratory.

The urea concentration test can be performed by the general practitioner. In private practice a close watch must be kept on the patient to see that the stipulated quantity of fluid is rigidly adhered to. Individual peculiarities with regard to diuresis are, I think, likely to vitiate the results.

The phenolsulphonephthalein test can only be performed by one skilled in colorimetric observations. So many factors, such as cardiac decompensation, renal congestion, and back pressure in the urinary tract, modify the result that the test is gradually being abandoned.

Renal efficiency tests have enabled us to distinguish between various clinical kidney conditions which formerly were difficult to separate. The following rough table will serve to illustrate this point.

RENAL EFFICIENCY SATISFACTORY.	RENAL EFFICIENCY POOR.
Arterio-sclerotic kidney.	Contracted granular kidney.
Chronic parenchymatous nephritis.	Acute or subacute nephritis with œdema.
Albuminuria (postural, physiological, etc.).	Nephritis.
Eclampsia.	Nephritis of pregnancy.

With greater certainty in our diagnosis there has come an increased possibility of making a correct prognosis, for on both practical and theoretical grounds it is certain that the outlook is better in those diseases in which the renal efficiency is not notably impaired. At present no renal efficiency test can be relied upon as an indication of impending uræmia.

A case of high blood-urea which is controlled by diet is more favourable than one which cannot be so regulated, and provided the diet be not altered repeated blood-urea examinations are of great service in measuring the progress of a case of nephritis.

Similarly in regard to treatment, the low blood-urea content of chronic parenchymatous nephritis is an inducement to adopt Epstein's high proteid diet, which is sometimes so effectual in dispersing the œdema. On the other hand, the high blood-urea value in chronic interstitial nephritis will be an indication to lower the protein value of the diet. It is worthy of note that the troublesome nycturia in this form of granular kidney is frequently relieved by the lessening of meat food.

Some minor matters of medical treatment are also dependent upon the results of our efficiency tests; for instance, with grave inefficiency one would naturally avoid the use of opium derivatives and of diuretics, whilst in arterio-sclerotic cases packs should be used with great caution. The operation of decapsulation in cases of subacute nephritis with œdema will largely depend, not only on the absence of cardio-vascular changes, but also upon the absence of any marked degree of renal inefficiency. These tests will also serve to distinguish the renal hemorrhage of chronic interstitial nephritis from hemorrhage due to other causes which may call for operative interference, and it is certain that they will be very widely adopted by

surgeons before undertaking operations for nephrectomy and prostatectomy, or for the removal of other obstructions to the urinary outflow. It must be fully understood, however, that the tests of renal efficiency are only supplementary aids, and they in no way take the place of the most careful inquiry into the physical condition of the patient, or of the ordinary examination of the urine.

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To be of the greatest service to the clinician efficiency tests must detect failure in an organ in its early stages, and give him facts where clinical signs have only given him suspicions. In the case of the kidney it is regrettable that the functional tests rarely do this.

All organs possess a physiological reserve power, and progressive disease, unless overwhelming in its initial onslaught, is always shadowed by a process of pathological hypertrophy. These two factors combine to make the determination of slight and moderate degrees of failure in any organ a problem of considerable fascination because of its great difficulties.

In the case of the kidney the shortcomings of all the available efficiency tests are due to the fact that no test measures the physiological reserve power. It is not until this is severely encroached upon that laboratory methods indicate functional failure. When the physiological reserve power is exhausted, and destruction of kidney tissue obvious from physical signs, the available efficiency tests are of proved service in prognosis, but only if considered in relation to clinical findings. The use of these tests will certainly be disappointing in the long run unless their short-comings are

appreciated. The routine series of kidney efficiency tests is at present an imperfect diagnostic machine, and the lazy clinician will certainly lose many of the coppers he deposits in the slot of such a defective mechanism.

The problem of renal efficiency from a pathological point of view embraces investigations along three lines :—

1. The perfection of methods for the examination of the urine, blood, and cerebro-spinal fluid during life.

2. The correlation of these findings with the *post-mortem* appearances of the kidney and other organs.

3. The localisation of failure to a particular part of the kidney or to some other organ.

Laboratory Methods.

Urea Concentration Test.

The urea estimation may be carried out by the accurate urease method, or by the considerably less accurate hypobromite method. The principle of the former test will be described later. The latter test should be performed, using a burette graduated in tenths of c.c.'s, and the evolved gas cooled. The volume of gas is transformed into the approximate urea percentage by reference to a table published by McLean, in which the hypobromite error for the urea is corrected by the urease method. I am indebted to Dr. O. C. M. Davis for pointing out to me that by doing a parallel estimation of the urinary ammonia by Folin's formaldehyde method, which takes under five minutes, an accurate figure can be obtained for the urinary urea by subtraction. This should be done in all cases where the precentage of urea falls between 1·9 and 2·2.

Phenolsulphonephthalein Test.

1 c.c. of a solution containing 0·6 mg. of this dye is injected into the deltoid, the patient is given a tumblerful of water to drink, and empties his bladder. At the end of

the first and second hours after injection he passes water into two separate labelled bottles. The total amount of dye in each sample is estimated in a colorimeter of the Duboscq type. Comrie[1] points out several details requiring attention in this test :—

(*a*) Absorption will be delayed if the dye be injected into an œdematous area.

(*b*) The colour comparison must be made with a standard dissolved and made up in the same way as the solution used for injection, as the dye changes colour considerably with slight variations in reaction.

(*c*) Blood in the urine must be centrifuged out. Hæmoglobin makes the test a wide approximation only.

The total amount excreted should be 70 per cent. of the amount injected, and the first sample should contain most of the dye.

This test suffers from the disadvantage of many colour tests, the personal variation in colour sense in different individuals. It occasionally gives obviously aberrant results, usually on the side of a false low reading, but generally indicates advanced renal damage.

Diastase Test.

The smallest amount of urine which digests a 0·1 per cent. solution of soluble starch in 30 minutes at 38° C. is estimated by putting up a series of dilutions of urine (fresh or preserved under toluol), and adding a constant volume of starch. The figure is called the diastatic index. In other words, the test is one which measures the amount of a ferment of doubtful origin in a fluid of varying reaction on the theoretical assumption that the diseased kidney finds a difficulty in excreting it out of the blood-stream. It is not known whether it is one of the normal functions of the kidney to excrete it or not. Many clinical pathologists have

[1] *Lancet*, 1921, ii. 1,150.

rushed into this side-track of enzyme estimation where most physiologists, equipped with the same facts, would fear to tread. I have never known the test to give any help in judging kidney efficiency. It is certainly of empirical value in diagnosing pancreatic disease.

The Estimation of Urea in Blood.

The earliest analysis of the blood in chronic Bright's disease seems to have been made by Dr. Guy Babington in a case under Bright's own care, who found as much urea in the circulating blood as in the urine![1]

The estimation is carried out by decomposing the urea of the blood by the specific ferment urease contained in Soya beans.

A test tube is provided with a well-fitting cork and 20 mg. of well-powdered potassium oxalate introduced; 4 c.c. (at least) of blood are withdrawn from a vein and quickly placed in the tube, which is at once corked and shaken; 3 c.c. are accurately measured into a large test tube containing 0.4 gm. of Soya bean meal. The pipette used for measuring the blood is filled with 5 c.c. of a 0.6 per cent. solution of potassium acid phosphate, which is introduced into the tube. Four or five drops of caprylic alcohol are added, and the tube closed by a rubber cork carrying two tubes with rubber attachments, which are clamped. The mixture is incubated in a water-bath at 40–45° C. for half an hour and shaken occasionally. It is then connected at one side with a wash-bottle of 10 per cent. sulphuric acid, and at the other side with a tube containing 25 c.c. of centinormal sulphuric acid. Air is drawn through the apparatus, passing through the wash-bottle, the fermentation tube, and the centinormal acid in turn. After aspirating for five minutes 5 gm. of anhydrous

[1] Fagge and Pye Smith, *Principles and Practice of Medicine*, second edition, vol. ii., p. 622.

potassium carbonate and 5 c.c. of a saturated solution of sodium carbonate are added to the contents of the fermentation tube, and aspiration is continued for half an hour. The apparatus is disconnected, and the acid titrated against centinormal caustic soda. 0.4 c.c. are subtracted from the result to allow for the trace of ammonia evolved from the meal. Each 1 c.c. of acid neutralised corresponds to 10 mg. of urea.

The following sources of error should be observed :—

1. The beans used should be capable of germination.

2. The meal should be a fine powder ground in a powder-mill and sifted on a wire sieve of fine mesh.

3. Its activity should be tested from time to time by controlling it against a solution of known urea content.

4. The acid and alkali should be very accurately standardised, and the same indicator used in the standardisation as is used in the titration. The most suitable indicator is methyl red. Phenolphthalein is inaccurate for this reaction.

5. There should be a long roomy glass connection between each tube to prevent acid or alkali being aspirated into the fermentation tube or acid tube, and care should be taken when adding the alkali that none touches the delivery tubes.

By this method the upper normal limit for the urea in blood is 40 mg. per 100 c.c. This figure varies physiologically with the protein in the diet, and tends to rise with increasing age. Thus the blood should be taken after a night's fast, and a slight increase in a child or young adult given greater weight than a similar increase in a middle-aged man.

Under physiological conditions the urea of the blood varies, like all its chemical constituents, within very narrow limits. A definite increase is a sign of great value and generally of grave import. It signifies extensive kidney

damage or impending total failure of some other organ, especially the heart, and although the estimation gives little information in cases of slight renal damage, it is of great service in arriving at a diagnosis of suspected impending uræmia and in the prognosis of all forms of chronic nephritis.

By the urease method figures between 90 mg. and 120 mg. are obtained in cases totally incapacitated by kidney disease —generally the contracting stage of parenchymatous nephritis, or in middle-aged men with arterio-sclerosis and simultaneous arterial disease of the kidney. A figure over 100 mg. denotes impending uræmia; in declared uræmia it often reaches 175 mg. to 200 mg.

The urea in the cerebro-spinal fluid is estimated by the same method as for blood. There is no increase except in declared uræmia, when the normal figure (20 mg. to 30 mg. per 100 c.c.) is increased to 150 mg. to 300 mg.

The correlation of the results of efficiency tests during life with the *post-mortem* estimate of the amount of kidney damage is a subject of great difficulty. A little experience soon shows that there is only the most gross parallelism in an appreciable number of cases.

Several factors contribute to this lack of agreement between the two estimates. In many cases in which efficiency tests during life indicate severe functional impairment the kidney does not show the widespread destruction associated with a pure renal death, and it becomes apparent that the functional failure depends on some other factor. This is often circulatory, and either due to myocardial failure, acting adversely on a damaged kidney, or to some grave intra-renal circulatory accident, such as widespread œdema of the interstitial tissue.

The effect of a failing general or local circulation is seen in many cases of pure arterio-sclerotic kidney, and in the

pale, swollen kidney of chronic parenchymatous nephritis. Much of the inefficiency of the large white kidney is vascular in origin, and the patient improves if and when his circulation improves.

The tubules in such a kidney are widely separated by œdema fluid, and their lumina obstructed by flocculated albumen and desquamated cells. The glomerular capillaries are compressed, accounting for the pallor of the organ, while the obstructed tubules and high water-content account for its increased bulk. The glomerular filtration-pressure in such a kidney must be considerably lowered, but the amount of destruction is appreciably less than is found in chronic glomerular nephritis.

Apart from the necessity of taking the circulation into serious account, several cardinal principles are to be kept in view in making the *post-mortem* assessment.

In the first place, if a lesion destroys the glomerulus the corresponding tubule will in time atrophy ; and, on the other hand, if a tubule is destroyed its glomerulus collapses and ceases to filter. A time will come, therefore, when it will be impossible to locate the initial injury.

Secondly, in any chronic nephritis as tracts of cortical tissue are destroyed the surviving tissue hypertrophies, its glomeruli enlarge, its tubules lengthen, and the tubular epithelium proliferates. It is therefore more important to gauge the extent of this hypertrophy on which the survival of the organ depends rather than the amount of actual destruction.

All progressive chronic nephritis tends to produce a uniform type of wrecked kidney, in which tracts of compressed shrunken tubules and glomeruli lying in vascular fibrous tissue form valleys between districts, often vascular in distribution, where the parenchyma shows active hypertrophy. These hypertrophied foci project on the surface as

granules, which in cases of pure renal death often show changes of fatty degeneration.

The following two cases illustrate the influence of the circulatory factor in judging renal efficiency :—

Case 1.—A man, aged 53, was admitted to hospital for paroxysmal dyspnœa, in an attack of which he died. Clinically he closely resembled a case of uræmia. His blood urea was 23 mg. His urea concentration test gave 2.8 per cent. and 1.4 per cent. There was a heavy cloud of albumen in the urine, and many granular casts.

Post-mortem.—The kidneys weighed together 7¾ oz. Section showed very conspicuous arterial disease in vessels of all calibres. There was a fair amount of fibrosis in the cortex, but compensatory hypertrophy was well established, and the surviving tissues showed little degeneration. His heart weighed 23 oz. The myocardium showed an extreme grade of fatty degeneration, and marked coronary artery disease. There was a patch of softening in the left corpus striatum.

The primary cause of death in this case was myocardial failure.

Case 2.—A woman, aged 53, with twelve months' history of dyspnœa, and blood pressure of 200–140 mm. Hg., died with symptoms of uræmia and general cardiac œdema. Her blood urea was 112 mg., urea concentration test 1.8 per cent. and 0.9 per cent.

Post-mortem.—Her kidneys weighed together 8¾ oz., and showed universal arteriolar disease. There was well-marked active hypertrophy, and nothing like the severe grade of destruction seen in cases of chronic glomerular nephritis. The heart weighed 24 oz., and showed macroscopic and microscopic fatty degeneration of a severe degree.

Here again the primary cause of death was considered to be myocardial failure.

The effect of general and local circulation applies to all cases of nephritis, because the condition is bilateral and generalised, and always at the onset, and often throughout its course, only a part of a general tissue reaction to some general infection or toxæmia which involves the circulatory organs simultaneously with the kidney.

Focal lesions of the kidneys do not produce usually severe grades of renal inadequacy. The specific kidney of subacute bacterial endocarditis, sprinkled with glomerular infarctions from bacterial emboli, may give little indication of functional damage ; and although such cases terminate with renal symptoms, the total amount of destruction found in such kidneys seems to indicate that the failing myocardium is the cause of the terminal renal inefficiency.

In examining *post-mortem* material it must always be borne in mind that the secretory epithelium of the tubules autolyses rapidly, and some degree of desquamation and swelling is often seen in normal kidneys *post-mortem.*

A PHYSIOLOGICAL CONCEPTION OF PROLONGED HYSTERICAL CONDITIONS. [1]

BY

H. H. CARLETON, M.A., M.D. Oxon.

IN any discussion on hysteria some psychological treatment cannot be avoided, but it is upon the physiological aspects of the subject that I wish to lay stress since the physiological disturbances are most pronounced when hysterical states have been in existence for long periods.

In recent years most of us became familiar with transient hysterical symptoms, which, under appropriate treatment, were quickly cured. Observations upon large numbers of soldiers have thrown much light upon the nature of hysteria and various definitions of hysteria have been evolved. One may cite Hurst's definition as fairly representing one section of medical opinion some three years ago. Hysteria, Hurst

[1] Paper read at meeting of the Bristol Medico-Chirurgical Society, on December 14th, 1921.

said, is a condition in which symptoms are present, which are produced by suggestion and which are curable by persuasion or psychotherapy; the essence of such a definition being that hysteria consists of the symptoms and nothing more; remove these, and you have a normal individual.

This modern conception of hysteria was in contradistinction to the older view of Charcot, who regarded hysteria as an enduring state, which could be detected, if looked for, by the presence of so-called stigmata; and that the subject of this chronic state revealed himself or herself in true colours from time to time by the development of exacerbations, namely acute hysterical symptoms. Babinski and others recognised that stigmata were for the most part created by the examining physician, and as a result Charcot's view fell into disrepute.

With the return swing of the pendulum, however, tribute was paid to Charcot's conception by certain schools of psychological medicine, which recognised the mental background of the hysteric as an important and lasting factor. These observers realised that the removal of the symptom did not necessarily or even usually cure the patient.

Clinical evidence all goes to favour the view that in many cases of hysteria physiological changes of an enduring nature are liable to occur and exhibit their presence both in the neuromuscular and the visceral and vascular systems of patients. These changes render the hysteric physically, as well as mentally, different from the normal individual and often difficult to cure.

The clinical complex hysteria includes, then, both a mental state and physical symptoms. The latter, since they afford obvious objective evidence, generally arrest attention. It is the relationship between the mental process, the overflow of nervous energy into the sympathetic nervous

system, the resultant endocrine disturbance, and the recoil, so to speak, of this upon the central nervous system, that comprise the essential factors in prolonged hysterical conditions.

The following case, which is a somewhat extreme type, may be taken as an example. Milder cases differ in degree only, and can be brought into line with such a general conception as I hope to lay before you.

A case of severe hysteria has been recently under my care, a man aged 30 years, wildly ataxic and spastic in legs, arms and body. He was so profoundly apprehensive that he started excessively at the slightest unexpected sound. The gross motor disturbances were accompanied by marked changes in the field of autonomic nervous control, that is in the visceral and vascular systems and in the endocrine glands. Manifestations of such changes included vasomotor instability, excessive sweating, tachycardia, exophthalmos, rapid breathing, anorexia, constipation, etc.

These changes require consideration from the point of view of certain physiological conceptions of an integrated nervous system.

First of all, let us turn our attention to the motor symptoms, ataxy and spasm. On examination, unequivocal signs of organic nerve disease were entirely wanting.

What, then, was the essential basis of this loss of equilibrium and lack of co-ordination?

Normally, when we are standing still or when we walk our static or kinetic equilibrium is assured by a series of tonic muscular contractions, which are integrated and adapted in segmental spinal, cerebellar and labyrinthine reflex arcs, named by Sherrington the proprioceptive system. This cerebellar system is adjuvant to, and subject to the control of, the highest levels of the nervous hierarchy, the cerebral system.

Nervous integration is so delicately adapted and complete,

that in a given situation the tonic contractions are automatically increased or diminished. Once learnt, equilibration recedes from attentive levels of consciousness and is harmoniously merged into a wider scheme of behaviour. The attentive level, at any particular moment, is the most comprehensive environmental field to which the organism is responding. All other aspects of the environment (to which subservient behaviour systems are responding at the time) are subconscious. They are in consciousness, but not in the upper level of attention. For instance, if I stop thinking about a business engagement to which my legs are carrying me I can *consciously* walk, if I cease to do this I can *consciously* take a step, ceasing this I can *consciously* merely equilibrate in the upright posture, or ceasing this I can become *conscious* of pressure on the soles of my feet. The stream of consciousness is simply this selected procession of environmental aspects, to which the body's ever varying motor adjustments are directed.

What bearing has all this upon the condition of the hysteric ?

Well, as a result of shock, anxiety, or emotion the hysteric is responding to a very restricted environmental field. Adjustments which in health are unconscious or automatic now occupy the highest level of attention. For instance, hysterics, probably owing to their vasomotor instability, are very prone to dizziness. This dizziness occupies the highest available levels of attention, and leads to false integration of sensory impressions. For the hysteric the ground moves and sways. No longer is walking automatic and controlled at unconscious levels ; it has become a painfully conscious experience. A single step, equilibration even, has become an adventure. The hysteric who tries to walk, because he is convinced of the necessity to make the experiment, at first dares not to put one foot in front of the

other. Then he plunges forward, and all at once takes such a stride that he loses his balance. It is practically the same as stepping off into the air, an act which will throw the best balanced person to the ground. More timid than ever, he tries to widen his base of support and straddles his legs in such a way that they resemble the lines of an arrow head. Then he tries to make a forward movement. It goes without saying that the very position he has taken up disturbs his centre of gravity, so that he cannot perform further movement without loss of balance.

Other patients begin by stiffening up all their muscles ; my patient showed this second type of inco-ordination in an extreme degree. He would momentarily relax on one side in order to advance. His efforts were rendered futile by the simultaneous contraction of the antagonists on the other side. In this type of neuropath, therefore, we are not dealing with a true ataxia of central or peripheral origin, but with motor inco-ordinations, based on false integration of sensory impressions, and the common characteristic of this kind of motor disturbance is over-shooting the mark.

Having briefly reviewed the condition as a disorder of behaviour, let us turn and see if we can discover any of the physiological correlates of the disturbance.

Apparently among other things the whole of the proprioceptive system, which deals with the automatic adjustment of deep muscle sense and integrates it with labyrinthine impressions, is entirely out of gear, and the cerebrum is making a poor effort to carry on in the absence of its chief of staff, the cerebellum.

The nervous system is built up of neurones arranged or integrated into patterns, which by their specific activity secure efficient response to environmental change. Inherited from countless generations of ancestors are found certain firmly-established neurone patterns, which we call instincts

With increased personal experience, that is to say, with the gradually developing capacity of the individual to respond to an increasingly complex environment, these original inherited dispositions, or neurone patterns, are subjected to modification, owing to conflict which arises between them and other more recently acquired patterns. These conflicts and modifications of developed and developing neurone patterns constitute the physiological basis of inhibitions. Now inhibitions are the very foundation of those disturbances in the sympathetic nervous system which manifest themselves as affective tones, pleasure or pain.

If one could conceive an animal with its nervous system so simply constituted that in it no neurone pattern ever conflicted with another, there would be no inhibitions. A stimulus would give rise to an appropriate motor response unaccompanied by any disagreable affective tone or feeling. Where flight into safety is easy the presence of danger gives rise to no fear ; but if flight is obstructed all gradations of affective tone from fear to terror result. If a soldier under fire can retreat to his dug-out he may appear entirely unconcerned by the shelling, whereas the same man caught in the open in an air-raid will experience " the wind up " to a high degree.

Without labouring the point, I think we may take it that it is the inhibition of neurone patterns *inter se* which is responsible for the affective or emotional aspects of experience.

Mental conflict and the development of excess of emotion is the curse of the hysteric. This leads to enduring physical stress and the physiological disturbances which are now under discussion.

What is the relationship between emotion and physiological processes ?

When affect or feeling is aroused there is an overflow of nervous energy into the sympathetic nervous system. All

of us are familiar with sudden vascular and visceral responses in the field of the autonomic nervous system when our feelings are powerfully aroused. Flushing or pallor, palpitation, increased respiration, sweating, etc., constitute not infrequently an almost instantaneous response to some exciting experience.

It is necessary to remember in this connection that the sympathetic or autonomic nervous system controls also those important structures the endocrine glands. The work of Cannon has established on a sure footing the relationship between anger and fear, etc., and the activity of the suprarenal glands. The manifestations of hyper- and hypothyroid metabolism in relation to the emotional disturbance are too familiar to need more than mention. Cushing and others have enlarged our knowledge of the relationship between the pituitary and other ductless glands and certain metabolic disturbances, characterised, among other phenomena, by mental changes.

In profound emotional states over-activity of certain endocrine glands is frequently very lasting, and is apparently responsible for the enduring nature of the neuro-muscular disturbances so often seen in hysterics and so difficult to cure.

Under conditions of great emotional stress endocrine activity is entirely physiological ; it is essential to successful reaction, essential even to life. This is seen in the turmoil of battles and in the excitement of athletic contests. A good pair of suprarenals may help to win a V.C. ; the rowing man stays the course by reason of his second wind, but the suprarenals supply the second wind. So much for the endocrine as a good servant. But the good servant may make a very bad master. Such does the endocrine gland become when it dominates the organism with its excessive activity.

The patient who is the subject of prolonged hysterical disturbance is thus dominated by his endocrines, notably by the thyroid and suprarenals. This endocrine disturbance is an important accompaniment of such motor symptoms as tremor, ataxy and spasm. These motor symptoms induce or increase apprehension and anxiety, which emotional changes in their turn lead to further excess of endocrine secretion. Thus a vicious circle is established.

Now both psychically and physiologically the hysteric's system is in a state of dissociation. If dissociation means anything on the physiological side, surely it means that there is a disturbance of synaptic relations, an increased resistance at synaptic junctions. The seat of action of certain substances, such as strychnine and tetanus toxin, is the synapse. It seems also as though excess of endocrine substance is powerful to increase resistance at the synapse, so that a functional dissociation occurs.

I go further and suggest that the delicate and complex synaptic junctions, where paths, efferent from the cerebellum, by the superior peduncles through the crossed rubrothalamic region to the cerebrum and mesencephalon, are particularly prone to suffer from this physiological dissociation or blocking.

Why do I say this? The cerebellar system, we must remember, is built up on the afferent side of the central nervous system, a great appendage so to speak, with specific functions, sharing responsibilities, but with no direct efferent spinal tract of its own. It has no efferent outlet independent of the great projection tracts of the motor cortex and mid-brain.

May I be allowed to use an analogy to illustrate roughly what I conceive to be the general relationship of the cerebellar system to the cerebrum and remainder of the central nervous system.

Consider for a moment a man on horseback. The rider in the saddle I compare to the cerebellum. He is very directly *en rapport* with his environment, that is to say his afferent relations are ample, but his powers of response are less direct, he must transmit his reactions through the reins to the horse, which ultimately decides the exact nature of the response. Drop the reins or dislodge the rider and co-ordination breaks down.

To return to our hysteric: dissociation which removes cerebellar influence leaves the cerebral levels overloaded with details of adjustment. The patient cannot attend to all these details simultaneously. He narrows down his field of attention and concentrates all his effort upon glaring defects of adjustment that trouble him most. He soon gives up the unequal task and becomes paraplegic, or develops a fantastic gait in his endeavour to circumvent some difficulty of his own creation.

A bad administrator is one who cannot or does not trust his juniors. He becomes inefficient and a muddler because he tries to attend to every small detail of business himself. He no longer possesses a comprehensive field, but his mind contains small restricted patches, isolated and incoherent.

Such would be the condition of the hysteric, but that he usually selects one particular item in experience for his undivided attention. How would the Navy have got on at Jutland if Admiral Beatty had sat in his cabin assiduously polishing his buttons?

This narrowing of attention is often strikingly obvious during the process of re-education of the hysteric, and is responsible for profound anxiety, inefficiency and consequent emotional disturbances, which result in further endocrine over-activity.

I have confined my remarks thus far to a type of case

in which the great proprioceptive system is out of gear. A little consideration will show how disturbances in the exteroceptive field may lead to comparable dissociation of synaptic relations. The organs belonging to the exteroceptive field are eyes, ears, nose and skin ; all of us are familiar with hysterical blindness, deafness and anæsthesia.

Here motor disturbances are inconspicuous, and therefore the anxiety condition is of a milder degree. Cures are proportionately easier to effect and relapses are more rare.

If enduring anxiety and endocrine disturbance is the basis of prolonged hysterical conditions, how are we to take them into our reckoning when attempting to effect a cure ? Let me refer for a moment to a useful conception of " suggestion " and " counter-suggestion." It follows from what I have said that unfavourable or harmful suggestion is the imposition of an idea which narrows the patient's field of conscious reaction, until systems which should be subservient in any comprehensive scheme of behaviour dominate consciousness. Favourable counter-suggestion, on the other hand, is the imposition of an idea which expands this field of attention and renders it adequately comprehensive.

Anxiety lest he fall may make the ataxic patient paraplegic ; don't let him flounder about, therefore, on the theory that the hysteric won't hurt himself, because he not infrequently does ; but worse than that, you will forfeit all confidence that he may have placed in you. Guard him carefully in the early stages, and insist that the grossest faults of posture and action be corrected, but don't carry your criticisms of his faults of gait to excess, for by so doing you are narrowing down his field of attention too much. The golfer who is told to alter his stance may think of this and forget to swing properly, then reminded of the latter

fault he begins to press, and so his faults accumulate *ad infinitum*. But let him have a ball on the match and a worthy opponent, then his stance, swing and tendency to press will take care of themselves.

So in the re-education of hysterical ataxy the stage quickly comes when the patient's field of attention must be expanded to respond to a comprehensive environmental field. The last stage of cure may be to make the patient run at top speed. The supreme demand, to run, entails enlargement of the field of response to such a degree that there is no time left for the patient to trouble about small details of gait, and normal progression results.

We are all familiar with some of the difficulties of the stammerer. When at ease he stammers little, the fear of stammering makes him inarticulate. Many a stammerer put through voice production exercises becomes hopeless; enlarge his field of attention and teach him to ignore his stammer, and he gets on quite well with his talking.

In conclusion, let me refer to a class of case which is frequently the subject of divided opinion on medical boards. Not infrequently it is affirmed that such and such a tremulous, paraplegic man is a malingerer, because he has frequently been seen walking normally when he did not know he was under observation. In justice to such patients we must remember that they are the victims of easily aroused anxiety and emotion, and that a relapse is their normal response to emotion, without any bad faith on their part, and that the relapse may reasonably be accounted for in terms of endocrine activity and physiological dissociation such as I have endeavoured to describe. The Medical Officer sitting in judgment behind the table at a medical board may be a powerful suggestive agent for evil.

Reviews of Books.

Clinical Surgical Diagnosis. By F. DE QUERVAIN. Third English Edition. Translated from the seventh edition by J. SNOWMAN, M.D. Pp. xvi., 914. London: John Bale, Sons and Danielsson, Ltd. 1921. Price £2 10s. net.—This work is written in a fresh and conversational manner, and in places one can almost imagine that the text had been taken down *verbatim* as Professor de Quervain stood by a bedside and demonstrated a case to a class of students. The author assumes throughout that his readers have mastered the elementary principles of routine examination, and are capable of recognising the simpler surgical pathological conditions. It will prove more valuable, therefore, to the senior student and the post-graduate than to the beginner. The two outstanding features of the book are, firstly, the great stress which is laid upon the value of the clinical history in effecting a diagnosis, and secondly the illustrations, which call for unqualified praise. Their acquisition must have entailed long and painstaking labour. As is natural in a book by a single author, which covers such a large field, it is somewhat unequally written, but we would especially commend that portion which deals with the diagnosis of abdominal conditions. Undoubtedly the book will prove a very valuable aid in the solution of many a puzzling diagnostic problem.

The Early Diagnosis of Tubercle. By CLIVE RIVIERE, M.D., F.R.C.P. Third Edition. Pp. xvi., 318. London: Oxford Medical Publications. 1921. Price 15s. net.—Two years have elapsed since the appearance of the last edition, the chief addition being to the section of Differential Diagnosis, with an account of pulmonary syphilis and pneumo-mycosis. The reputation of the book as an authoritative and masterly presentation of one of the most difficult problems in medicine is well established. Criticism can be directed only to the amount of the information. We feel the work would receive a greater recognition if the author would quote more from his own experience and give less prominence to the work of others. The chapter on the value of X-rays in diagnosis gains in interest in that Dr. Riviere states definitely his opinion of the interpretation of such findings. He also holds out the hope that in future editions he will prune that portion dealing with specific diagnosis. As he himself says, "the amount of space devoted to tuberculin . . . . will be found to correspond more closely with the

claims . . . made for it, than with its actual worth in diagnosis." The scheme of physical examination outlined by the author requires endurance of high degree both on the part of the patient and certainly of the physician.

The Clinical Study of the Early Symptoms and Treatment of Circulatory Disease in General Practice. By R. M. WILSON, M.B. Pp. xvi., 245. London: Oxford Medical Publications. 1921. 15s. net.—In this little book Dr. Wilson enlarges upon matters already considered by him in the other books he has published: the mechanism by which the speed of the heart is altered in disease, the origin of dyspnœa, and so forth. The method which he has adopted—the observation and correlation of clinical phenomena—is worthy of all encouragement. Not medicine alone, but also human physiology and pathology, owe more to such observations than to laboratory work, divorced from the bedside as it so often is. In the adoption of the clinical method Dr. Wilson is indeed a follower of Sir James Mackenzie, to whom the book is dedicated. And there is another aspect of that distinguished exemplar's work which may best be summed up in the opening sentence of his preface to the first edition of the *Diseases of the Heart*, "In the following pages are given the results of observations on affections of the heart, made during an active practice of over a quarter of a century." Dr. Wilson might do worse than let his ideas ripen and his observations accumulate, for as long a period, before committing them to print.

The Clinical Examination of the Nervous System. By G. H. MONRAD-KROHN, M.D. Pp. xv., 135. London: H. K. Lewis & Co. Ltd. 1921. Price 6s. net.—This book gives a very full and clear account of the systematic method of examination of the nervous system, including an outline of the examination of the mental state of patients. Appendices also deal with Binet-Simon tests, diplopia and vestibular tests. There are also several very useful anatomical diagrams. It should prove most helpful to students and house physicians.

On Modern Methods of Treating Fractures. By ERNEST W. HEY GROVES, M.S., M.D., F.R.C.S. Second Edition. Pp. xix., 435. Bristol: John Wright & Sons Ltd. 1921. Price 30s. net.—The new edition of this excellent book well repays study. It has been largely re-written, and the majority of the illustrations are new. The author embodies in it his extensive experience obtained during the war, and introduces all good modern methods of the treatment of fracture in addition to his own. He emphasises the fact that each has its special application, and that a combination of two or all is always essential

to the most satisfactory results, each performing a special function and being founded on some definite principle which is complementary to the other methods. The Report of the Fracture Committee of the British Medical Association showed that the function obtained varied largely with the excellence or otherwise of anatomical alignment following fracture. The methods of attaining good alignment are considered under three headings. *Massage and Movements*, which need be the only treatment where no serious displacement has occurred. *Extension*, which should be applied where operation is refused or unsuitable and for fractures in children where it is most successful. *Operation* for gross deformities, especially in the leg bones, for fractures in the adult and when a week's extension and massage have failed to bring about reduction. From the author's experiments, which have been largely devoted to operative methods of accurate alignment and fixation, the fact emerges that these ends have been best attained by means of plates fixed by long bolts or pins or by strong intramedullary pegs. The history and literature of bone grafting is more fully reviewed and the author's experimental work on this is given in detail together with instances of its practical application in the treatment of fractures.

A Physical Interpretation of Shock, Exhaustion, and Restoration. By GEORGE W. CRILE, M.D. Pp. xvi., 232. London : Oxford Medical Publications. 1921. Price 25s. net.—This large and well illustrated volume gives a full exposition of the author's extensive and far-reaching studies on the nature of surgical shock. The metabolic changes, the alterations in the nerve-cells and those of the liver and other organs, the distribution of the blood in the vascular system, and the relation of shock to the secretions of the endocrine glands are explained, and some sort of a theory of shock evolved. There is a good chapter on prevention and treatment, and if this follows what are now well-known lines it should be borne in mind that Crile's previous publications have contributed not a little to the settlement of those lines. He is more earnest than some observers in his advocacy of opium as a remedy for shock. Unfortunately the bibliography, full as it is, was evidently collected before the publication of the important British researches at the conclusion of the war, and therefore the book cannot be described as quite up to date. Also the author's speculations as to the exact nature of the intra-cellular changes that take place in shock will need a good deal of physiological examination before they can be considered as of much importance.

The Journal of Metabolic Research. Edited by FREDERICK ALLEN. Published by the Physiatric Institute, Morristown New Jersey. Price $10.00 per year.—We have received for exchange the first number of a new journal which is intended to serve for the publication of the results of original research in the problems of metabolism. The Editor, Dr. F. M. Allen, whose work on Diabetes is widely appreciated, explains how the *Journal* has come into existence. A series of papers on diabetic pathology found such difficulty of acceptance by other journals on the score of length and expense, that after ascertaining that this difficulty had been experienced by other workers in the same field, it was decided to establish this *Journal of Metabolic Research*. The Editor hopes to be able to publish papers promptly and at full length, stipulating only that they shall contain significant facts in the briefest form compatible with completeness. The expense of such a publication must necessarily be high, and apparently the Institute of Physiatric Research is undertaking the financial responsibility involved. The first issue contains a number of papers by Allen and his fellow-workers dealing in the main with observations upon experimental diabetes. They are of the greatest interest, and leave us in no doubt that the *Journal* will rank amongst the most valuable of the periodicals devoted to experimental pathology.

Intrinsic Cancer of the Larynx and the Operation of Laryngo-fissure. By IRWIN MOORE, M.B., C.M. Pp. xii., 147. University of London Press. 1921. Price 20s. net.—The very high percentage of permanent success now obtainable from the operative removal of intrinsic cancer of the larynx, provided the nature of the growth be recognised while still in a favourable position, renders this authoritative and detailed exposition of the subject most opportune. The instruments devised by the author are widely known and used by laryngologists, and are the outcome of his exceptional opportunities for improving the technique of laryngo-fissure for laryngeal cancer. Success in these operations depends greatly on minute details, firstly in the diagnosis, then in the preparation of the patient, on the operation, but lastly and not least on after treatment. All these aspects of the question are fully considered, and the author is not content to relate his own methods, but throughout affords reasoned argument with abundant citation of the work of other authorities, in support of his advocacy of methods which have such important bearing on results. The book is profusely illustrated, most of the drawings being both original and very helpful. The author is to be congratulated on the work comprised in this small volume.

Bowel Diseases in the Tropics. By Sir LEONARD ROGERS, C.I.E., M.D. Pp. xvi., 475. London: Oxford Medical Publications. 1921. Price 30s. net.—Sir Leonard Rogers has combined his works *Cholera and its Treatment* (1911) with *The Dysenteries, their Differentiation and Treatment* (1913) under the above title; an additional final short chapter on Hill Diarrhœa and Sprue completes the volume. The hypertonic saline treatment in cholera and the emetine treatment of amœbiasis, two subjects to which the distinguished author has made such notable and original contributions in Therapy, are treated in the greatest detail. Table XXI., confirmatory of the value of the hypertonic saline and permanganate treatment, is very instructive. The mortality of the writer's cases is 22.35 per cent. (2,009 treated), as compared with 59 per cent. (1,243 treated) in previous years. On page 288 an analysis of 32 consecutive cases of amœbic dysentery treated by emetine illustrates the very considerable lowering of mortality, 10 per cent. as against 43.3 per cent. in the ipecacuanha series, and the still more satisfactory shortening of the period of dysenteric symptoms to 2.35 days from 11.4 in the other series. In discussing the late complication of cholera, namely suppression of urine, wrongly called, we think, uræmia, Sir Leonard quotes the blood pressure findings in such cases. It is quite clear from the text that the suppression of urine is intimately connected with the circulatory failure, pressures below 100 mm. Hg being associated with anuria. There are six beautiful coloured plates illustrative of the dysenteric processes both amœbic and bacillary. One is perhaps unique, the result of one week's treatment with emetine, death from perforation of the cæcum. The mucous membrane is destroyed extensively in several places as far down as the peritoneal coat. As the author points out, such a condition is not compatible with recovery. Diagram 3, based on an analysis of over 100 *post-mortem* examinations of dysentery, emphasises in a graphic manner the distribution of the lesions in the various clinical types of dysentery, both acute and chronic. The book should, we feel, be received with gratitude by all whose work lies in the tropics. It is packed with information, statistical, clinical, and therapeutic; the recent work in the etiology of the dysenteries receives full recognition. We hope that future editions will consider sprue in greater detail.

Editorial Notes.

The Routine of Operations for Tonsils and Adenoids.

UNDER the heading we borrow from the *British Medical Journal* (April 1st, 1922) attention is directed to the recommendations issued by the Council of the Laryngological Section of the Royal Society of Medicine on the hygienic conditions which should be observed in performing operations for the removal of tonsils and adenoids in hospitals and other clinics for children. The need for adequate experience in diseases of the ear and throat by the surgeon in charge of these cases is rightly emphasised, for ability to operate on tonsils and adenoids is not sufficient, what is equally important is diagnostic skill to recognise the various conditions which predispose to nasal catarrh and to differentiate between those cases where operations are absolutely necessary and those for whom other treatment is more suitable. Other points which are emphasised are (1) that all patients requiring operation for tonsils and adenoids ought to be kept in the hospital for at least forty-eight hours, and (2) that before they are discharged inquiry should be made as to the home conditions, especially with reference to the presence of infectious diseases, and (3) that printed instructions should be issued to the parents for the preparation of the patient before admission and also for after-treatment when the patient is discharged from the in-patient wards. But as it is impossible to treat all cases as in-patients until more adequate accommodation is available, the Council urge (4) that, when a child is to be operated on and sent home the same day, investigation should have always been made beforehand as to the adequacy of the home accommodation and supervision, and also the absence of adverse sanitary

conditions. Further (5) that the child should be visited by a nurse after discharge, particularly in the case of children who are denied the safeguards of in-patient accommodation. And lastly (6) that every child who is sent home on the day of operation should be transferred in an ambulance or hired conveyance, and not left to the discretion of a poor parent to take it home in a public bus, tram or train.

We feel that these recommendations ought not to be necessary, and yet it is common knowledge that even these essentials have not been observed uniformly. To take a child from a dirty home, so crowded that it is impossible to keep the patient separated from other children, then without any inquiry as to the presence in the house of diphtheria or scarlatina, etc., to operate and send the child straight back to take its chance, is discreditable. Moreover, the recommendations of the Council as to the proper provision of adequate waiting-room accommodation, and that the recovery room should be scrupulously clean and well ventilated and provided with separate beds or couches for each patient, should be acted on by those institutions where such conditions do not already obtain. No institution should be allowed to continue to take the little children for operation on tonsils and adenoids or any other operation unless they can provide at least the essentials for their comfort and safety.

The Ministry of Health through its Educational Authorities have done an immense service in inspecting school children and in recommending the proper treatment to remove defects; and further in many large towns and centres they have provided school clinics for this treatment to be carried out. For some diseases such provision has been made by the Bristol Education Committee, but we hold that, where such clinics are not provided, the Education Authorities should see to it that means for the carrying

out of their recommendations are rendered available, either at voluntary hospitals, or failing that at the rate-supported hospitals. If the means at the disposal of the hospitals are inadequate, they should be supplemented by grants from the Educational Authority, subject of course to these institutions affording the essential special surgical service and accommodation. This would be true economy, for it is wasting public funds to provide medical inspectors to tell parents what treatment is required for their children without ensuring that such treatment is available within the limits of those parents' resources.

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The late Mr. H. H. Wills, Pro-Chancellor of the University of Bristol.

WHILE this issue was in the press we learnt with profound regret that Mr. Harry Wills had died. Such a generous philanthropist, who has afforded such splendid service in promoting the Faculty of Medicine in Bristol, will ever be remembered in its University.

His public services and gifts took many directions, but we propose only to touch on Mr. Wills' work in developing medical work in our midst.

Perhaps the most striking movement that he initiated was the amalgamation scheme to fuse all the voluntary hospitals working under one general committee of direction so that economy in working, the development of large, highly-equipped departments and a united medical staff might result. The amalgamation scheme was not brought to completion, nevertheless it gave a new impetus to the work carried out at the voluntary hospitals. While avoiding either advocacy or criticism of that scheme, which may or may not fructify in future in some modified and perhaps improved form, the enthusiasm displayed by the late

Harry Wills has left its mark and merits our grateful remembrance. When this scheme was brought forward Mr. H. H. Wills was the President of the Royal Infirmary, his elder brother, Mr. George A. Wills, being President of the Bristol General Hospital. Before resigning his Presidency of the Royal Infirmary, owing to failing health, Mr. Wills gave £100,000 to the funds of that hospital. At the same time he continued to develop another project, by the purchase of Cote House at Westbury-on-Trym, where he proceeded to

By courtesy of the Bristol Times and Mirror

HENRY HERBERT WILLS, 1856-1922.

build a Home for Incurables, St. Monica's Home, and he further set apart securities representing a sum of about one million pounds for the endowment of that institution.

Yet it is probable that even more far-reaching in its practical influence on medical work is the munificence of Mr. H. H. Wills in connection with the building of the University, and his gift of the new Physical Laboratory, to be built and equipped on the Royal Fort site that he had conveyed to the University. These, with many other noble gifts to his fellows to which we make no reference here,

afford lasting evidence to future generations of Mr. Wills' wise generosity. But for those who enjoyed his personal acquaintance it is what he was, rather than all he has done, that leaves the deep sense of bereavement, since they alone knew the retiring, kindly disposition and warm heart of the man whose chief interest in life was to devise the most useful methods of spending and being spent for others. One of his characteristics was to throw himself heart and soul into the work and schemes he initiated, and he devoted an almost meticulous care to details, so as to ensure perfectly successful issues to his efforts.

To his brother, Mr. George A. Wills, with whom he joined in building the new University buildings now so far advanced, it must be a sore grief that his fellow Pro-Chancellor will not be with us to see the completion of their joint gift, the magnificent University buildings.

To his widow, whose collaboration in the many works to which Mr. Wills set his hand, was so invaluable, as well as to his brothers and other members of his family, we tender our sincerest sympathy.

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Professor James Swain, C.B., C.B.E., retires from practice.

We note that Dr. James Swain has relinquished practice as a consulting surgeon, an announcement that will cause widespread regret to all his colleagues and professional confrères. To retire at the zenith of a great reputation, full of honours, yet with many years of unfettered activity for other interests, is an achievement many would envy and few could emulate.

We are glad to know that he will continue in his Clifton residence, and that his exploration of fresh fields will not take him from our midst.

Obituary.

ROBERT SHINGLETON SMITH, M.D., B.Sc., F.R.C.P.

BRISTOL has lost one of her most distinguished physicians by the death of Dr. Robert Shingleton Smith, M.D., B.Sc., F.R.C.P., which occurred on Saturday, April 15th, at his residence, "Deepholm," Clifton Park, at the age of 76. He had been in very indifferent health for the past two years owing to heart trouble, and latterly seriously ill for some months. He was a man of many parts, prominent in many spheres of life, and renowned in them all.

He was born August 24th, 1845, at Charlton Horethorn, on the Dorsetshire border of Somerset, and educated at the Taunton School, now known as Queen's College, where he gained one or more exhibitions and prizes.

While apprenticed to a doctor at Shepton Mallet, he learnt first to dispense and also the rudiments of Anatomy and Botany.

In 1862 he gained a Warneford Scholarship in King's College, London, and thus began his brilliant student career. He gained in 1863 the Junior Medical Scholarship and other prizes and distinctions. He was also working at the same time at other subjects in science. In 1864 he won the gold medal in Botany at the Apothecaries' Hall, and in 1865 the Senior Medical Scholarship in King's College.

He took the Bachelor of Science degree at the University of London with first class honours in the separate departments of Botany, Zoology, Geology and Palæontology. First class honours were also gained in Anatomy, Materia Medica and Chemistry while studying for the degree of Bachelor of Medicine—in addition to these he won prizes for essays in King's College Medical Society.

In 1867 he was appointed House Physician to King's College Hospital, and in that year he took his degree of Bachelor of Medicine in the London University, gaining the Scholarship and gold medal in Midwifery, as well as first class honours in Medicine.

In 1868 he took the M.D. of the London University, passing first and gaining the gold medal. Such an exceptionally brilliant academic career must have led up to a Physiciancy in a London hospital had he decided to wait; but after holding a London Dispensary appointment for two years, together with

the Sambrooke Registrarship in King's College, he was elected to a Resident's Post in the Bristol Royal Infirmary, and in 1873 he was appointed Honorary Physician, and thus at 28 years of age commenced practice in Clifton.

In 1874 he was appointed Lecturer in Physiology at the Medical School. It was most fortunate that he was available for this very important post. The subject was being rapidly developed by most able scientists in this country and abroad. The teaching in many of the London hospitals was passing from the members of the Medical Staff to special teachers in Physiology. Smith was quite capable of dealing with the subject up to a full medical standpoint, and until 1887 he continued to study, teach and lecture on Physiology to the satisfaction of the examining bodies and with very successful results on the part of his students. No one in Bristol at that time could have so satisfactorily undertaken these duties, and his colleagues at the Medical School and University College at that time were under a deep obligation to Shingleton Smith for undertaking this unremunerative and very strenuous work.

In 1887 he became Lecturer at University College in Pathology, and a year later was made conjoint Lecturer in Medicine with Dr. Markham Skerritt. Later they became Professors, and in 1894 Smith resigned. When the University of Bristol was founded in 1908 he was designated Emeritus Professor of Medicine. The degree of M.D. *honoris causâ* was conferred upon him by the University in 1912.

Just at the time when Smith joined the Honorary Staff at the Royal Infirmary a long-felt need in connection with the Medical School had become urgent. The lecturers of the School, feeling the inadequate accommodation in the old Park where good work had been attempted since 1833, decided to make an appeal to the public to obtain funds for a new building. A preliminary circular was drawn up, but at a meeting held on February 3rd, 1873, Mr. Thomas Coomber, Lecturer on Chemistry at the School, suggested that a School for Science should be started in Bristol, of which the Medical School should be a part. The idea was warmly taken up by the Faculty of the School; meetings were held and interest was spread among the citizens, and the idea taken up by those interested in education and by members of the older Universities.

On June 11th, 1874, a public meeting convened at the Victoria Rooms to promote the establishment of a "College of Science and Literature for the West of England and South Wales" was very largely attended.

A preliminary circular had been issued, and it was signed for the Local Committee by Gilbert Elliot, Dean of Bristol,

Chairman; Wm. Proctor Baker, Wm. Lant Carpenter, Lewis Fry, Honorary Secretaries; R. Shingleton Smith, Secretary. The first resolution passed at the meeting in favour of the founding of such a College was by Professor Williamson, President of the British Association, and was seconded by Professor Jowett, Master of Balliol, and supported by Mr. E. A. Freeman, Bishop Temple, W. B. Carpenter, Professor Roscoe, of Manchester, and others. Thus the proposal of Thomas Coomber, which was the outcome of an effort on the part of the lecturers of the Bristol Medical School, resulted in the foundation of University College, the forerunner of the University of Bristol. Shingleton Smith was Secretary to the organising Committee of the College. He was throughout strongly in favour of the Medical School being an integral part of the new College, and others agreed with him. Many of the Medical School lecturers, however, did not share this view, and for several years the institutions were merely affiliated and worked in some co-operation. It was a lasting disappointment that the Medical School held aloof from University College when the latter was first founded.

The first Calendar of the University College was published in 1877. The College was then located in Park Row, while the Medical School continued its work in the Old Park. Within a year or two, however, most of the teaching was done in the new University College buildings in Tyndall's Park, and actual incorporation of the two bodies (the School becoming a part of the College) took place in 1892.

A Medical and Chirurgical Society had formerly existed in Bristol in which excellent work had been done, but it had long ago ceased to exist. The first and only volume of Bristol Royal Infirmary Reports was edited 1878–1879 by Dr. Spencer and Greig Smith.

On February 20th, 1874, a printed circular letter was issued after consultation among the more scientific members of the profession, signed by Nelson Dobson, Shingleton Smith and W. H. Spencer, stating that it is proposed to establish for Bristol and Clifton a new Medical Society, the prominent feature of which will be the development of the pathological and clinical resources of the place, but formed on a basis sufficiently broad to include all the departments of scientific and practical medicine. A preliminary meeting was held, presided over by Crosby Leonard, at which the following officers were elected: President, Dr. Brittan; Secretary, Dr. Shingleton Smith; with a Committee, Drs. Beddoe, Martyn and Spencer, Messrs. Dobson, Gloag and Griffiths, and in March the Bristol Medico-Chirurgical Society was duly inaugurated with its laws and regulations fully drawn up.

There can be no question as to who did the main work in carrying on the Society, and there is little doubt also as to who was its *fons et origo*. The early minutes are in Smith's handwriting, and his pen has freely annotated the original printed list of the rules.

At the end of the notes of the meeting on June 23rd, 1875, Smith writes: "The next meeting would take place in September." This meeting was actually held on October 27th, 1875, and the minutes were taken by Dr. Spencer. The President regrets that no meeting was held in September, but that in consequence of ill-health Dr. Shingleton Smith had been obliged to go abroad for the winter. He had shown symptoms of phthisis, and was sent away for a long voyage.

This must have been a very grave matter for the young physician, who had just married. But fortunately not only for himself but for his colleagues he made a good recovery. The notes of the Society are taken by Dr. Spencer, who acted as Secretary in Smith's absence for another year. The familiar handwriting appears again in the minutes of the Society on January 24th, 1877, and from this date until November, 1888, without intermission, Shingleton Smith is again the writer of all the notes. For fourteen years his untiring activity and energy were devoted to the duties of Secretary, to such good purpose that the young Society was enabled to survive all its early trials, and eventually placed upon a firm and enduring foundation.

In 1888 he was elected President of the Society, with Munro Smith as Secretary. Not only had he acted as Secretary, but had made many and various contributions and had frequently taken part in debates.

Meanwhile the Bristol Medico-Chirurgical Society and its energetic Secretary had been the means of still further developments in the medical history of Bristol.

Dr. Henry Edward Fripp in his presidential address, 1878, suggested the publication of *Transactions of the Bristol Medico-Chirurgical Society*. He said, "However unpretending as a literary effort, the publication of *Transactions* by a Society marks its growing self-consciousness of present active power . . . . and might be welcomed as a proof that the medical centre of the West of England maintains its claim to be considered a teaching power, fairly abreast with the general progress of science, and able to sustain its old repute."

It was decided to carry out the President's suggestion, and papers were selected from among the proceedings during the year 1874–1878. This volume was issued in the latter year. In 1882 the second volume of the *Transactions* should have been issued, but it seemed to several of our members inexpedient

to publish papers so long after they had been read, and it was thought that an improved form of publication might be issued at shorter intervals.

At a meeting held on October 11th, 1882, a resolution was proposed by Dr. Beddoe, seconded by Mr. Greig Smith, " That in the opinion of this Society the time has come when the various medical and surgical interests of the West of England ought to be united by the publication of a periodical journal which might appear under the auspices of the Medico-Chirurgical Society." The scheme was reported on and *The Bristol Medico-Chirurgical Journal* was launched, with Greig Smith as Editor and L. M. Griffiths as Publishing Secretary, and under this extremely able management the quarterly *Journal* continued to flourish for nine years. In its very first number, July, 1883, the first paper was by Shingleton Smith on " The proofs of the existence of a Phthisical Contagion." It was a masterly summary, based on all the best scientific knowledge of the day, and supported by his own microscopical investigation, with an epitome of 49 of his cases where he had found tuberculosis bacilli, and 23 cases in which he had failed to find them in cases in lung affection which had not typical symptoms of phthisis. He says the supreme question is not merely whether tuberculosis is infectious, that seems proved, but whether the bacillus of Koch is the infective agent, and he sums up, " If the observations (he has quoted) be accurate, there is only one conclusion—that these bacilli cause tuberculosis." This paper was considerably in advance of the knowledge of the day, and was not in accord with the opinions held in regard to tuberculous disease by many skilled clinical physicians at that time. The subject of his Presidential Address on October 10th, 1888, was on " Some recent developments of the Germ Theory, more particularly in relation to the treatment of Phthisis."

Nearly twenty years afterwards he was most active in assisting Dr. Lionel Weatherly when that gentleman started the campaign which led to the establishment of the Winsley Sanatorium for consumptives, which was opened in 1904, and of which Shingleton Smith became Chairman of Committee, and afterwards President. His professional experience had taught him the need of such a place, and he threw his whole heart into the movement. He addressed many meetings held in the district, which were arranged to arouse public opinion on the question, while he brought the weight of his influence to bear upon his friends who were in a position to lend a helping hand. His services were freely recognised by all who were anxious that adequate provision should be made in this locality for combating the ravages of this national scourge. To have a physician of his high reputation on their side was of material

assistance, and in the Winsley Sanatorium we have a lasting memorial of one who delighted in doing good.

When Greig Smith had completed nine years of arduous and most successful work as Editor of *The Bristol Medico-Chirurgical Journal*, some relief was given him by the appointment of a small Editorial Committee in addition to his Assistant Editor, Mr. Griffiths. But he found himself unable to continue, and to the great regret of all he resigned the post. A very strong resolution of thanks was passed by the Society. The *Journal* had reached a very high standard of merit, was a convenient way of publishing local scientific work, and was a very valuable means by which books came for purposes of review and found their way into the Medical Library. The vacancy must be filled by a capable Editor. Shingleton Smith's name was at once thought of, but would it be possible for him to find the time? He was very busy in private practice, in addition to his daily work at the Infirmary, his lectureship at the Medical School, and his scientific enquiries. After consideration he decided to accept the post, with Mr. Griffiths as Assistant Editor and the small standing Editorial Committee. For twenty years he retained this very important position, and the *Journal* continued to flourish. On his retirement he was heartily thanked, and a letter was circulated containing the following: "The retirement of Dr. Shingleton Smith from the Editorship of *The Bristol Medico-Chirurgical Journal*, after so many years' invaluable work, is a fitting opportunity for the members of the Society and others to express their appreciation of his unremitting and important services whereby not only this Society, but the whole of the profession in Bristol and the neighbourhood has greatly benefited. When the Society was founded in 1874 Dr. Shingleton Smith was appointed the first Honorary Secretary, and it is largely through his energy and capable management that we have now such a fine Medical Library and so flourishing a local *Journal*." He was entertained at a largely attended dinner, and was presented with a silver salver and a painting that he had selected by Reginald Smith. He had previously, together with Mr. N. C. Dobson and Mr. L. M. Griffiths, been elected an honorary member of the Medico-Chirurgical Society.

Continuously working in the hospital wards on the clinical aspect of medical problems, he was a very accurate practical physician and diagnostician, but he added to this a widely-trained scientific mind. He was a very good pathologist and histologist, and made full use of the advances in chemical and microscopical science towards a knowledge of the causation as well as the cure of disease.

He was a lucid teacher and gave much time to the students,

and he was always glad to help them, and any of his junior colleagues in whose professional progress he took much interest.

He was a very generous-hearted man. When he became busy as a consultant he still found time to attend on his ordinary patients, and not least those from whom he had little or no pecuniary recompense. The payment of a few guineas is a small matter to a man who is all day long concerned in the saving of life or of health. It is the progress of his patient that concerns him, not the pecuniary advantage he is going to reap. His kindly good nature had no ill word for anyone. His geniality and his power of talking on so many subjects made him deservedly popular, and some will remember the little dinners he gave to his colleagues from the country and others when they came up to our local medical meetings. His presence was always welcomed at International Congresses on Medicine as well as at those of the Medical Association. He was a member of the Committee of the Bristol Dispensary, Queen Victoria Convalescent Home, and the District Nurses' Society. He was deeply interested in astronomy and archæology, while his love of botany led him to become a Fellow of the Royal Horticultural Society. On all these subjects his knowledge was wide and accurate.

His labours in connection with the Mary Carpenter Memorial in 1878 is only one example of his many deeds of unselfishness and goodwill. He took the lion's share of the work for this Memorial, and received a very handsomely expressed letter of thanks from the members of her family.

Smith had sad trials in life. His wife was for many years an invalid, and his two daughters died at an early age. He also lost one son in the war and another was killed by an accident. The following letter shows with what courage and constancy he continued his work :—

September 27th, 1921.

Dear Stock,

I am sorry I shall not be able to attend the meeting of the Med. Chi. Committee to-morrow evening. Please make my apologies. I have no breath for walking or talking, and am useless. Under these circumstances I think it will be best to remove my name and elect some more useful person.

With best wishes for the future of the Society,

I remain,

Yours very sincerely,

R. SHINGLETON SMITH.

His was a fine unselfish life used for the good of others, and it is sad to feel that he suffered so much in his latter days. We offer our sympathy to his sister, his surviving son and his grandchildren.

F. RICHARDSON CROSS.

Another old and close friend writes :—

To general practitioners of Bristol and the surrounding counties Dr. Shingleton Smith was widely known as a Consultant Physician. For close upon forty years the writer of this and he were contemporaneous, and his services were repeatedly sought in cases presenting difficulty or requiring superior skill. Not once did he ever fail, and the assistance he gave was always of the greatest advantage both to the patient and the ordinary medical attendant. He had the gift of coming to a definite decision without hesitation—that is as far as obscure medical diseases can possibly permit ; but he brought his experience and quick perception to give, in nearly all cases, the malady a patient was suffering from a " local habitation and a name." Most practically, and particularly too for the relief of the sufferer, came the line of treatment to be pursued. This was invariably of the most rational nature. No long flowery prescription of former ages, but some definite remedy whose influence he supported by the theory of its therapeutic action and its effect as confirmed by his own experience of its use.

A constant association of Dr. Shingleton Smith with the writer of this in time crystallised into a long and perpetual friendship, never separated and never marred. On several occasions holidays were taken together—the Annual Meetings of the British Medical Association, with also fields of interest outside the province of medicine. One outing was a week spent in Dickens' land from Rochester to Broadstairs, visiting all the interesting places in that quarter that are mentioned in Dickens' works. What a wealth of general and scientific knowledge he displayed ! Another longer excursion was, after a fortnight's stay at Harrogate, the journey to Aberdeen to attend the quater-centenary of the University. Nothing escaped his observant eye. After a long day of travel, when one was wearying to see the Girdleness lighthouse, and turn round the angle of the coast which brings into view the fine panorama of the distant granite city, Dr. Shingleton Smith rose to his element in studying the conformation of the undulating fields and general rising of the surface of the earth leading to the cropping out of the Grampian Mountains. Freely he quoted from memory from the writings of Hugh Miller and Sir Charles Lyall, and when we skirted along and saw the rocky coast of Kincardine he was almost beside himself with sublimity and delight. It was assuredly a privilege to be the companion of a worshipper of nature such as he was ; it was God's work, not that of man, that his soul was set upon.

A large congregation, in which were many of his old medical colleagues, listened to the very touching tribute to his character paid by the Vicar at St. Paul's Church, Clifton, on the day of the funeral. One might support those lofty thoughts by a

quotation which Dr. Shingleton Smith used himself many years ago in his Presidential Address at the Bath and Bristol Branch of the British Medical Association : " Let me not live after my flame lacks oil, to be the snuff of younger spirits whose apprehensive senses all but new things disdain."

J. M. RATTRAY.

The Editor was associated with his lost friend from his earliest student days, later became closer while clerking for Dr. Shingleton Smith at the Royal Infirmary until he was elected to the Honorary Staff. For many years his work with Shingleton Smith was not confined to the hospital, and he was entrusted with his private practice. It was a privilege and a constant postgraduate education to be working

with such a clinician, but a far greater privilege to enjoy his intimate friendship. Shingleton Smith was ever ready to throw himself heart and soul into any new work that was presented, and when the writer was initiating the movement that crystallised in the Gloucester, Wilts and Somerset Association for the Prevention of Tuberculosis, with Dr. E. Long Fox as Chairman, Shingleton Smith's reputation as an authority on the subject

was most valuable, and his enthusiastic support one of the prime factors of the successful outcome of the undertaking, viz. the establishment of the Winsley Sanatorium. No one who knew Shingleton Smith could fail to be very deeply impressed with the energy and breadth of mind of this great physician, and of the profound sense of duty, unselfishness and high principle that underlay his whole work and life. Mr. Cross has done no more than justice to his work, and in doing so he was compelled to traverse a large part of the developmental work of medicine in the West of England for several decades, for the simple reason that Shingleton Smith's inspiration was behind it all the time.

The small pencil drawing was made by the Editor on the card at the dinner held in honour of Dr. Shingleton Smith in 1913, and it endeavours to portray the twinkle that was so characteristic of the subject.

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Local Medical Notes.

UNIVERSITY OF BRISTOL.—Students of the University have recently passed the following examinations:—

CH.M. (*Gynæcology*).—R. S. S. Statham.

CH.M. (*Laryngology*).—E. Watson-Williams.

D.P.H. (*Part I. only*).—B. A. Astley-Weston.

M.B., CH.B. BRISTOL.—W. K. A. Richards. *Final Examination* (*Part II. Completing Examination*): Phyllis Beames (2nd Cl. Hons.), M. Critchley (1st Cl. Hons.), Madge E. Golding, W. A. Jackman, Winifred G. Nott (2nd Cl. Hons.), P. Phillips (1st Cl. Hons.), Victoria S. Tryon. *Part I.* (*including Forensic Medicine and Toxicology*): B. A. Crook, Constance L. Griffiths, J. M. Evans, F. J. Hector, Marguerite G. Hughes, F. May Jones, A. J. Keevil, E. C. K. Kenderdine, Doris M. Pullen, J. A. L. Roberts, H. L. Shepherd. *Part I. only:* F. H. Bodman, Carrie H. Osmond, H. J. H. Spreadbury. *Second Examination* (*Part II.*): A. F. Alford, K. F. Alford, A. T. Binnie, G. W. R. Bishop, H. W. Brassington, D. E. Crellin, B. V. F. Dawkins, C. H. Durnford, F. S. Dymond, S. J. H. Griffiths, C. I. Ham, F. H. Hollingshead, J. A. Hooker, C. T. Hyatt, A. H. Lowther, R. E. Lucas, G. M. Minifie, W. S. Ormiston, B. Y. de la Pasture, M. P. Posthuma, D. C. Prowse, L. G. Robertson, E. S. Rogers, H. Rogers, H. J. Satchwell, J. F. Southward, S. P. Taylor, G. M. Terrell, M. M. Te Water, T. W. Ware, K. M. Willmore.

Second Examination (*Part I.*): A. H. Bright, A. P. Gorham.

In Elementary Anatomy (*Completing Examination*): J. F. O. Bodman, M. E. Drew.

In Organic Chemistry only: U. M. Hopkins.

DIPLOMA IN DENTAL SURGERY.—*Final Examination:* W. Bayly, L. C. Bodey. *Third Examination* (*Dental Mechanics and Materia Medica*): J. F. Rigg. *Dental Mechanics* (*Completing Examination*): S. H. Bedford, W. B. Bawrey, M. P. Browning, H. P. Evans, G. J. Kelly, R. Lonnon, R. C. Price, J. R. Ritblatt, J. S. Roberts. *Dental Mechanics and Metallurgy only:* A. V. Harding. *In Dental Metallurgy only:* J. J. Gillard, R. G. Downes, D. Griffiths, B. Florence Taylor. *Second Examination:* F. J. Farr. *In Physiology and Histology and Anatomy* (*Completing Examination*): J. Evans, H. C. Hopes, K. A. Hunt, E. H. Longney, C. G. Payne, H. W. Pigeon, M. Ritblat, C. G. Saxon, C. R. Woods. *In Physiology and Histology and Anatomy only:* G. G. Royal. *In Dental Anatomy only:* V. E. N. Allen, H. N. V. Barnes, S. H. Bedford, A. S. C. Boulter, M. P. Browning, A. H. Butcher, R. G. Butterworth, L. H. Challenger, H. P. Evans, G. C. Friend, G. Holt, G. J. Kelly, R. C. Price, J. S. Roberts, W. H. Simpkiss, C. E. Smith, K. M. Watson, F. C. Winter.

B.D.S.—*Second Examination:* E. K. Tratman. *Final Examination:* G. N. Season.

L.D.S., R.C.S., ENG.—*Dental Mechanics:* C. E. Down, G. S. Williams. *Dental Metallurgy:* N. H. Simmonds. *Anatomy and Physiology:* D. J. Andrews, L. G. House.

F.R.C.S. EDIN.—E. Watson-Williams.